NINAD KALE

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PROFESSIONAL SUMMARY

- Proficient in C, C++ programming, and Python Scripting
- Experienced in multi-core software development for safety-critical applications like Motor Controllers (FOC, PID, V/f)
- Hands-on experience in building projects on development boards like TI F28388D & F28335 DSP, DE0 nano FPGA, Arduino, RPi, Beaglebone
- Proficient in designing, synthesizing and debugging embedded systems in bare metal as well as multi-threaded real-time environment
- Familiar with communication protocols: SPI, I2C, UART, CAN, IPC and peripherals: ADC, PWM, GPIO, DAC, eCAP, X-BAR, DMA
- Strong interpersonal skills and ability to work efficiently in a team environment

WORK EXPERIENCE

Honeywell – Embedded Software Engineer II – Bangalore, India September'20 – August'22

Safety-Critical PMSM Motor Control Firmware (DO-178B compliant) used for Aircraft Cooling –

- Implemented **Field-Oriented** speed controller algorithm in C, employing dual core architecture on F28388D DSP with bare metal
- Designed robust power-on and continuous **built-in tests**, performing failure mode analysis of hardware and firmware
- Upgraded **bootloader** with ECC protection, CRC check, dual core compatibility with software loading via UART using proprietary software
- Wrote **drivers** for ADC, SPI, EEPROM, IPC, Timers with **99% MC/DC code coverage** on VectorCAST validation testing
- Generated high level documentation for all aspects of software development in accordance with DO-178B guidelines. This includes all project specifications, design, test and hazard analyses for the software implementation

Real-Time fault analysis for PMSM motors. Ideated, Prototyped and Led research project with team of 5 –

- Modeled PMSM motor in Simulink from scratch and added air gap eccentricity & bearing defect, demonstrating proof of concept
- Wrote **real-time fault detection** algorithm in C performing FFT analysis of currents. Achieved 96% detection rate across all motor platforms
- Reverse engineered proprietary communication protocol to send and remotely visualize FFT in real time using Python script
- Delivered a first functional prototype in 3 months (50% faster than predicted), potentially saving **$1M/year**

Awarded Silver Medal in 2022 and Bronze in 2021. Director's recognition and secured funding of $10K for impactful R&D initiatives in 2022

Indian Navy / IIT Bombay – Research Assistant (Prof. Vachaani) – Mumbai, India August '19 – August'20

- Key member in development of **remotely operated underwater vehicle** used for ship inspection in Indian Navy
- Finalized technical specs (sensor, thrusters, battery) through in-depth feasibility analysis of endurance, controls, navigation & perception
- End-to-End designed, manufactured and tested electrical system, incorporating actuators power and control, sensors (DVL, IMU, Altimeter, Camera, Pressure Sensor), communication (CAN, SPI, I2C), single board computer, GPU

Airpix – Firmware Engineering Intern – Mumbai, India May'19 – July'19

- Added firmware patch of no-permission no-takeoff feature for drones incorporating GPS, Pixhawk, API communicating with backend server
- Developed internal tools in Python that streamlined company-wide processes, resulting in saving over 5000 hours

National Institute of Oceanology – Embedded System Intern – Goa, India May'18 – July'18

- Built **software-in-loop** simulator on Beaglebone for testing underwater vehicle controls & navigation. Used ADCs, PWMs, I2C, UART
- Enabled position tracking via MQTT over GSM, facilitating ocean-wide monitoring of deployed underwater vehicles

PROJECTS

IROS 2023 Finalist - F1Tenth, Autonomous Racing December'22– December'23

- Engineered **Traction Measurement** hardware, providing data insights into performance & control dynamics along with traction control
- Improved VESC firmware with real time battery monitoring and tuned PID parameters with 10% faster speed response

Student Team - Autonomous Underwater Vehicles - Video October'16 – July'20

- Integral member in development of AUVs Matsya 4, 5, 6 from **ideation, manufacturing, integration & testing** (Elec, Mech). Led team of 55
- Wrote firmware for 3DOFs Arm (PID/CAN), Battery management system, Actuators controls, Power using Arduino/STM32
- Architected acoustic communication system using acoustic transducers, frequency modulators, power amplifier, achieving speed of 10bits/s
- Competitions: Winner of National NIOT 16' & 18' | Finalist in International RoboSUB 17'- Autonomous Underwater Robotics

TECHNICAL QUALIFICATIONS

- **Languages** : C, C++, Python, Bash scripting, MATLAB, Simulink, Assembly, VHDL, CUDA
- **Hardware** : F28388D DSP, C28x, ARM Cortex M, AVR, STM32F446RE, FPGA, Raspberry Pi, ESP32, Jetson Nano
- **Tools** : GCC, CCS IDE, Device Drivers, Linux Device Drivers, RTOS, Bare-Metal Firmware, Git, EAGLE, LTSpice

EDUCATION

- **M.S** in Engineering Science - Robotics, University at Buffalo, NY | GPA - 3.9/4.0 December'23
- **B.Tech** in Aerospace with minor in Electrical Engineering, Indian Institute of Technology Bombay, India July'20

Courses : Analog and Digital Electronics, Embedded System, VLSI, Signals Processing, Microprocessor, Control Systems, Modeling
Awards : Young Researcher by IEEE OES, Institute Technical Citation 20', Institute Technical Award 19'